

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A structure comprising a substrate bearing, on at least part of its surface, a photocatalytic antisoiling layer ~~based on~~ comprising titanium dioxide ( $\text{TiO}_2$ ), ~~characterized in that~~ wherein said photocatalytic antisoiling layer is coated with a thin nonporous layer, ~~containing~~ comprising silicon and oxygen and having a covering power, wherein said thin nonporous layer ~~capable of~~ mechanically and chemically ~~protecting~~ protects the underlying photocatalytic layer, while maintaining the photocatalytic activity of the titanium dioxide ( $\text{TiO}_2$ )  $\text{TiO}_2$ .

Claim 2 (Currently Amended): The structure ~~as claimed in~~ of claim 1, ~~characterized in that~~ wherein said thin nonporous layer ~~containing~~ comprising silicon and oxygen is present in the form of a continuous film.

Claim 3 (Currently Amended): The structure of claim 1 ~~as claimed in either of claims 1 and 2~~, ~~characterized in that~~ wherein said thin layer ~~containing~~ comprising silicon and oxygen is present in the form of a film that conforms to the surface asperities of the underlying photocatalytic antisoiling layer.

Claim 4 (Currently Amended): The structure of claim 1 ~~as claimed in one of claims 1 to 3~~, ~~characterized in that~~ wherein the thin nonporous layer ~~containing~~ comprising silicon and oxygen is a layer of at least one silicon-oxygen compound ~~chosen from~~ selected from the group consisting of  $\text{SiO}_2$ ,  $\text{SiOC}$ ,  $\text{SiON}$ ,  $\text{SiO}_x$ , ~~where~~ wherein  $x < 2$ , and  $\text{SiOCH}$ .

Claim 5 (Currently Amended): The structure of claim 1 ~~as claimed in one of claims 1 to 4, characterized in that~~ wherein the thin nonporous layer ~~containing~~ comprising silicon and oxygen is a layer of at least one silicon-oxygen compound ~~with which~~ further comprising at least one compound ~~chosen~~ selected from the group consisting of  $\text{Al}_2\text{O}_3$  and  $\text{ZrO}_2$  is associated.

Claim 6 (Currently Amended): The structure as claimed in claim 5, ~~characterized in that~~ wherein the Al/Si, the Zr/Si, or the Al/Si and Zr/Si (Al and/or Zr)/Si atomic ratio does not exceed 1.

Claim 7 (Currently Amended): The structure of claim 5 ~~as claimed in either of claims 5 and 6, characterized in that~~ wherein the structure comprises  $\text{Al}_2\text{O}_3$  and wherein the Al/Si ratio is ~~between~~ from 0.03 and to 0.5, ~~in particular between 0.05 and 0.1.~~

Claim 8 (Currently Amended): The structure of claim 5 ~~as claimed in one of claims 5 to 7, characterized in that~~ wherein the structure comprises  $\text{ZrO}_2$  and wherein the Zr/Si ratio is ~~between~~ from 0.05 and to 0.4.

Claim 9 (Currently Amended): The structure of claim 1 ~~as claimed in one of claims 1 to 8, characterized in that~~ wherein the thin nonporous layer ~~containing~~ comprising silicon and oxygen has a thickness of at most 15 nm, ~~especially at most 10 nm and in particular at most 8 nm, being preferably at most 5 nm, or about 5 nm, in particular 2 to 3 nm.~~

Claim 10 (Currently Amended): The structure as claimed in claim 1 ~~one of claims 1 to 9~~, characterized in that wherein the photocatalytic antisoiling layer ~~titanium dioxide-based layer~~ consists of  $\text{TiO}_2$  alone or of  $\text{TiO}_2$  doped with at least one dopant ~~chosen especially~~ selected from ~~the group consisting of N~~ ~~pentavalent cations such as~~ of Nb, pentavalent cations of Ta ~~and pentavalent cations of V~~, ~~Fe~~ and Zr.

Claim 11 (Currently Amended): The structure of claim 1 ~~as claimed in one of claims 1 to 10~~, characterized in that wherein the  $\text{TiO}_2$ -based layer photocatalytic antisoiling layer has been deposited by

a sol-gel method,

or by a pyrolysis, ~~especially chemical vapor deposition~~, method

or by room-temperature vacuum sputtering,

~~where appropriate magnetron and/or ion beam sputtering~~, using a metal or  $\text{TiO}_x$  target, ~~where~~ wherein  $x < 2$ , and in an oxidizing atmosphere, or using a  $\text{TiO}_2$  target in an inert atmosphere, the  $\text{TiO}_2$  produced by the sputtering then ~~having possibly~~ optionally being subjected to a heat treatment so as to be in the crystallized state in a photocatalytically active form.

Claim 12 (Currently Amended): The structure ~~as claimed in~~ of claim 1 ~~one of claims 1 to 11~~, characterized in that wherein the thin nonporous layer ~~containing~~ comprising silicon and oxygen has been deposited by room-temperature vacuum sputtering, ~~where appropriate magnetron and/or ion beam sputtering~~, using a target of Al (8 at%)-doped  $\text{Si}_3$  in an  $\text{Ar/O}_2$  atmosphere, at a pressure of 0.2 Pa.

Claim 13 (Currently Amended): The structure ~~of claim 1 as claimed in one of claims 1 to 12, characterized in that it includes~~ further comprising, immediately below the photocatalytic antisoiling layer ~~TiO<sub>2</sub>-based layer~~, an underlayer having a crystallographic structure for assisting in the crystallization, by heteroepitaxial growth, in the anatase form of the ~~TiO<sub>2</sub>-based photocatalytic antisoiling upper layer, especially an underlayer consisting of~~ ATiO<sub>3</sub> where A denotes barium or strontium.

Claim 14 (Currently Amended): The structure ~~of claim 1 as claimed in one of claims 1 to 13, characterized in that~~ wherein the substrate ~~consists of~~ comprises a sheet, whether plane or having curved faces, wherein the sheet comprises at least one material selected from the group consisting of monolithic glass, or laminated glass, glass-ceramic, [[or]] and a hard thermoplastic, such as polycarbonate, or else of glass fibers, or glass-ceramic fibers, wherein said ~~sheets~~ sheet or said fibers ~~having, where appropriate, have, optionally,~~ received at least one other functional layer before application of the ~~TiO<sub>2</sub>-based layer~~ photocatalytic antisoiling layer or ~~of~~ or have, optionally, received a layer for assisting in the crystallization of the ~~latter photocatalytic antisoiling layer~~ photocatalytic antisoiling layer by heteroepitaxial growth.

Claim 15 (Currently Amended): The structure ~~as claimed in~~ of claim 14, comprising the at least one other functional layer, wherein ~~characterized in that the~~ at least one other functional layer or the other functional layers are chosen is selected from the group consisting of layers at least one layer having an optical functionality, at least one thermal control layer layers and at least one conducting layer layers, and wherein also, if the substrate ~~is made of~~

comprises glass or glass-ceramic, the at least one other functional layer acts ~~layers acting~~ as a barrier to the migration of alkali metals from the glass or from the glass-ceramic.

Claim 16 (Currently Amended): A process for manufacturing ~~[[a]]~~ the structure of claim 1 ~~as defined in one of claims 1 to 15, comprising~~ characterized in that

depositing an optionally doped  $\text{TiO}_2$  layer ~~is deposited~~ on a substrate ~~made of~~ comprising glass, ~~or~~ glass-ceramic, ~~or~~ polycarbonate-type hard plastic, of the sheet type, ~~or~~ on glass fibers, or glass-ceramic fibers,

wherein said optionally doped  $\text{TiO}_2$  layer ~~being~~ is optionally subjected to a heat treatment in order to give it a photocatalytic property if ~~this~~ the photocatalytic property is not provided by the conditions used for depositing the optionally doped  $\text{TiO}_2$  layer, ~~it~~, and

depositing then a thin layer ~~containing~~ comprising silicon and oxygen ~~as defined in one of claims 1 to 9 is deposited~~ on said photocatalytic layer, to form the structure of claim 1.

Claim 17 (Currently Amended): The process ~~as claimed in~~ of claim 16, ~~characterized in that~~ wherein the deposition of ~~[[a]]~~ the  $\text{TiO}_2$  layer and ~~that of~~ the thin layer ~~containing~~ comprising silicon and oxygen are carried out in succession at room temperature, by vacuum sputtering, ~~where appropriate magnetron and/or ion beam sputtering~~, in the same chamber, the conditions being the following:

- for depositing the  $\text{TiO}_2$ -based layer, supply in AC or DC mode, at a pressure of 1-3 mbar and in an oxygen/inert gas (argon) atmosphere, using a Ti or  $\text{TiO}_x$ , target, where  $x = 1.5$  to 2; and

- for depositing the layer ~~containing~~ comprising silicon and oxygen, supply in AC mode at a pressure of 0.1 to 1.0 Pa and in an Ar/O<sub>2</sub> atmosphere using a target having a high silicon content,

the deposition of the TiO<sub>2</sub> layer being optionally preceded by the deposition of an underlayer for assisting in the crystallization by epitaxial growth in the anatase form of the TiO<sub>2</sub> layer.

Claim 18 (Currently Amended): The process of claim 16 ~~as claimed in either of claims 16 and 17, in which the coating of~~ wherein the substrate is a glass or glass-ceramic substrate ~~is carried out, wherein~~ characterized in that, before application of the TiO<sub>2</sub> layer ~~or of the underlayer associated therewith,~~ at least one layer forming a barrier to the migration of alkali metals present in the glass or glass-ceramic substrate is deposited on the substrate, and wherein, optionally, an annealing or toughening operation ~~then possibly being~~ is carried out ~~[[,]]~~ after the TiO<sub>2</sub> layer and the thin ~~silicon-based~~ layer covering the latter TiO<sub>2</sub> layer have been deposited, ~~at a temperature of between 250°C and 550°C, preferably between 350°C and 500°C, in the case of the annealing operation and at a temperature of at least 600°C in the case of the toughening operation.~~

Claim 19 (Currently Amended): The process of claim 18 ~~as claimed in one of claims 16 to 18, characterized in that~~ wherein, after the ~~optional~~ application of the at least one layer forming a barrier to the migration of alkali metals and before application of the TiO<sub>2</sub> layer ~~or the underlayer associated with the latter,~~ at least one functional layer selected from the group consisting of at least one layer ~~chosen from layers~~ having an optical functionality, at least one thermal control ~~layers~~ layer, and at least one conducting ~~layer~~ layers is deposited, wherein

said ~~functional layers~~ at least one functional layer is being advantageously deposited by vacuum sputtering, ~~where appropriate magnetron and/or ion beam sputtering.~~

Claim 20 (Currently Amended): A single ~~Single~~ or multiple glazing, ~~in particular for motor vehicles or buildings,~~ comprising, on at least one face respectively, ~~[[a]]~~ the structure as defined in claim 1 ~~one of claims 1 to 15, said face being especially that facing the outside, or possibly also that facing the inside.~~

Claim 21 (New): The structure of claim 11, wherein the  $\text{TiO}_2$  is subjected to a heat treatment so as to be in the crystallized state in a photocatalytically active form.

Claim 22 (New): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises magnetron sputtering.

Claim 23 (New): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises ion-beam sputtering.

Claim 24 (New): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises magnetron sputtering and ion-beam sputtering.

Claim 25 (New): The structure of claim 14, wherein the sheet or the fibers have received at least one other functional layer before application of the photocatalytic antisoiling layer.



Claim 26 (New): The structure of claim 14, comprising a layer for assisting in the crystallization of the photocatalytic antisoiling layer by heteroepitaxial growth.

Claim 27 (New): The process of claim 16, wherein the  $\text{TiO}_2$  layer is doped.

Claim 28 (New): The process of claim 17, comprising depositing an underlayer for assisting in the crystallization by epitaxial growth in the anatase form of the  $\text{TiO}_2$  layer.

Claim 29 (New): The process of claim 18, comprising carrying out an annealing operation, wherein the annealing operation is carried out at a temperature of between  $250^\circ\text{C}$  and  $500^\circ\text{C}$ .

Claim 30 (New): The process of claim 18, comprising carrying out a toughening operation, wherein the toughening operation is carried out at a temperature of at least  $600^\circ\text{C}$ .